Current Botany 2011, 2(4): 44-47
ISSN: 2220-4822
www.scholarjournals.org

CURRENT BOTANY
www.currentbotany.org

Bioprospection of Some Plants for Management of *Aedes egypti* L.

P. P. Sharma[1*]., A. B. Pardeshi[2] and Dinesh Vijigiri[1]

[1]Dept of Botany, Deogiri college, Aurangabad
[2]Dept of Zoology, Deogri college, Aurangabad

Article Info

Article History

Received : 20-12-2010
Revised : 29-03-2011
Accepted : 30-03-2011

*Corresponding Author

Tel : 919440641545

Email:
dr_ppsharma@yahoo.co.uk

Abstract

Insecticides and pesticides of plant origin have been receiving attention in recent years to overcome the environmental hazards caused due to exhaustive use of synthetic ones. India is rich in biodiversity and Known for vast treasure of knowledge about use of plants for various purposes. In the present study the different concentrations of ethanolic extracts of some plants were tested for larvicidal and adulticidal activity against the of *Aedes ejypti* L. The percentage mortality was found to increase with higher concentrations of plant extracts which indicates direct relationship between the dose and percent mortality. The plant *Artemisia nilgirica* (C.B.Cl.) Pamp. and *Annona squamosa* L. were shown wide spectrum activity to control vector *Aedes ejypti* L. While some other species such as *Blumea eriantha* DC. , *Calotropis procera* (Ait.) R. Br., *Lavandula bipinnata* O. Ktze. have also shown the activity.

Key Words: Natural extract, Insecticidal, *Aedes ejypti* L.

Introduction

Household insects and pests are creating nuisance and controlling them is a big task as they grow very fast. Many methods have been tried to control these pests but none is found to be 100% effective and even some synthetic ones have given good results but some time their residues which are being accumulated in water, food, milk, etc have become serious cause of concern. Chemical control is the most popular as it is quick and effective but disadvantage is of the insecticidal /pesticidal residue, which is transmitted to human beings and the animals. These residues are known to remain active for many years and their degradation is slow. Moreover, chemical pesticides and insecticides show good results in the beginning but later on these become less effective due to the resistance generated by the insects / pests. Therefore, there is every need to find out alternative for the chemical pesticides.

Conventional synthetic insecticides today pose threat of not merely potential but actual human injury and damage to environment – to wit the almost ubiquitous presence of impermissible toxic residues in nearly all biotic and abiotic components of different ecosystems (Gupta and Gupta, 1979)

It is estimated that in USA alone 200 deaths are occurring every year due to insecticide poisoning (Srivastava, 2002). WHO estimated that each year there are 25 million cases of pesticide poisoning and as many as 20,000 unintentional deaths, primarily in developing countries (Devkumar and Dureja, 2002). Due to high pesticide residue level recently 130 containers of fresh grapes sent form India were rejected by Netherlands (Nag *et al*, 2004). Government of India has shown concern over the harmful effects of chemical insecticides/pesticides and has banned 23 chemical pesticides so far, 7 have been refused registration and 10 have been restricted for their use in the country (Chandurkar, 2001). The World Wildlife Fund (WWF) has called for a global ban on the production and use of DDT by 2007 (Dureja 2000). Apart from residues, hazards like resistance, cross-resistance, nonspecific broad-spectrum effects, high persistence, secondary pest resurgence etc. are also attributed to conventional synthetic insecticide.

During last few decades, indiscriminate and unabated use of chemical insecticides has resulted in several socio-economic problems, and as a result, the concept of Integrated pest management (IPM) has come into existence. Different technologies are used under this program.

Among different technologies used in IPM, the use of botanicals to control household insect-pest is being looked upon as a main source for safer and eco-friendly insecticide/pesticide. Since, botanicals are more eco-friendly, economic, species specific, biodegradable and have lesser or no harmful effects on non-target organisms including human being (Halfield-Law, 2000); Mumcuoghi et al, 2002) can be possible alternative to the chemical pesticides. Natural/plant products have been used as insecticides by human, since before time of ancient Romans, a practice that continue to the present time (Klocke *et al* 1987). A well known example is Neem, which is used traditionally since ancient times (Attri, 1982) by different ethnic societies and today neem based insecticide/pesticides are well accepted throughout the world. Like-wise there remains rich and diversified flora of India untapped as a source of botanical pesticides/insecticides.

Indigenous knowledge regarding control of household and agricultural insects/pests is developed through the observations of ethnic groups to overcome the problems. This knowledge has been tested using the trial and error methods over a period of time through generations and validated to make the established rich heritage of knowledge. Thus, indigenous knowledge varies from tribe to tribe and usually passes on to the next generations through verbal communication usually by the elders of the family.

India, with its tremendous plant as well as ethnic diversity and rich traditional knowledge about plants as treasures of

medicine/drugs and as a source of pesticides, is seating on goldmine. In spite of vast plant diversity in India, emphasized research on the preparation of plant pesticide/insecticide has not gained ground (Ignacimuthu, 2004). In the modern era of synthetic organic pesticides only few plants have gained importance as pesticide (Yong & Tang, 1988). This is due to lack of scientific attention rather than the lack of pesticidal potential of plants.

In India, about 250 species of higher plants are being used traditionally for insect and pest management. However, very few plants known as commercial success by way of field ready formulations has been very limited.

Hence present study was undertaken to find out eco-friendly, economical, readily available and effective insecticides preparations, which are expected to be devoid of any residual or the cumulative toxicity to the end user.

Materials and Methods

For present work plants were selected based on the traditional leads obtained through field work done in different parts of the Maharashtra state and information from literature. The plant materials were collected and dried under shade. Identification of plants materials were done using regional and state level floras and plant material were deposited in the Herbarium, Post Graduate Department of Botany, Deogiri College, Aurangabad.

Dried plant material grinded for extraction. Ethanolic extracts by using Soxhlet apparatus prepared by using 16 parts of ethanol to 1 part of the dried course powder. The extracts were stored at –18°C until further analysis or assay

A] Collection and maintenance of mosquito:

Collections were done from dump sites of the town and were reared in insectariums of the department at 25 – 28^{0}C temperature.

Mosquito adults and larvae were provided the food as per standard protocols.

B] Larvicidal assay:

The assay was performed by exposing twenty (III and IV instar) larvae of *Aedes ejypti* L. A series of at least five concentrations plant extracts (0.5; 1.0;1.5; 2.0; 2.5 %) were used. The water temperature maintained at 25± 1^{o}C. For each test three beakers containing distilled water and test larvae but without sample were used as controls. Observation on mortality and deformities of the larvae was recorded after every 24 hrs. of continuous exposure and this was expressed as percent mortality, the lethal concentration considered at which 50% of the test larvae were killed.

C] Adulticidal assay:

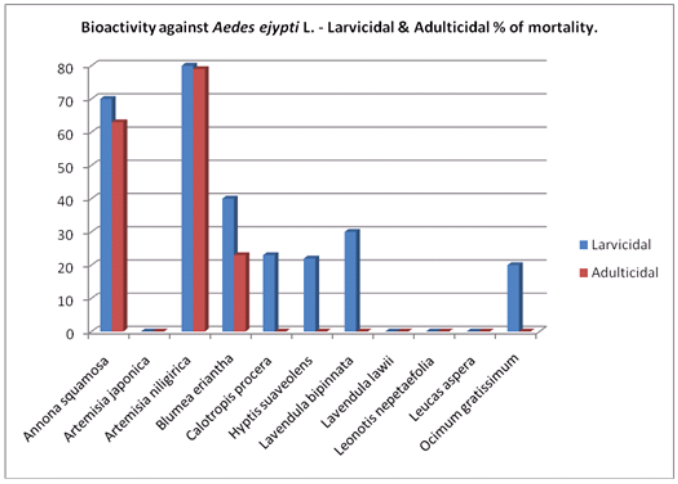
In Mosquito: Fresh adults were exposed to filter paper treated with ethanolic plant extracts of different concentrations. The paper was lined inside the beaker. The muslin cloth used to cover the beaker was also treated with the extract. For control insects were exposed only to ethanol treated paper and muslin. Mortality count was taken after 24 hrs.

D] Repellent assay:

The ethanolic extracts were evaluated for their repellent activities using the human – bait technique (Fradin & Day, 2002). For each test using differne concentrations, 10 laboratory-reared female mosquitoes were placed into separate cage. Volunteers were asked to follow the testing protocol. Volunteers conducted their test of each concentration by inserting the treated and control arms alternatively into a same cage for 3 minute. The mosquitoes that landed and attempted to probe and imbibe any blood were recorded. If no mosquito bites occurred in the initial 3 min, the arm was withdrawn from the cage and re-tested every 15 min. Each test concentration was repeated five times and in each replicate subject different volunteers to nullify any effect of colour of the skin on repellent.

Table 1: Bioactivity against *Aedes ejypti* L. with percentage of Mortality.

Sr.No	Plant Name	Plant part	Bioactivity in %		Repulsion
			Larvicidal	Adulticidal	
1	*Annona squamosa* L.	Stem	70.00	63.00	- ve
2	*Artemisia japonica* Thunb.	Whole plant	00.00	00.00	- ve
3	*Artemisia niligirica* (C.B.Cl) Pamp.	Whole plant	80.00	79.00	+ ve
4	*Blumea eriantha* DC.	Whole plant	40.00	23.00	+ ve
5	*Calotropis procera* (Ait.) R. Br.	Leaves	23.00	00.00	- ve
6	*Hyptis suaveolens* (L.) Poit	Leaves & Stem	22.00	00.00	+ve
7	*Lavendula bipinnata* O. Ktze.	Whole plant	30.00	00.00	+ ve
8	*Lavendula lawii* Wight	Whole plant	00.00	00.00	- ve
9	*Leonotis nepetaefolia* (L.) R.Br.	Leaves & Stem	00.00	00.00	- ve
10	*Leucas aspera* (Wild.) Link.	Whole plant	00.00	00.00	- ve
11	*Ocimum gratissimum* L.	Whole plant	20.00	00.00	+ ve



Resutls and Discussions

Larvicidal and adulticidal activity of ethanolic extracts of some plants against *Aedes ejypti* L. is given table 1. After 24 hours of exposure the percentage mortality in *Artemisia niligirica* was 80 and 79 while in *Annona squamosa* was 70 and 63 against the *Aedes ejypti* L. larvicidal and adulticidal activity respectively. In rest of the tested plants comparatively lesser effects were found or in some plants no activity found. The percentage mortality was found to increase with higher concentrations plant extract which indicates direct relationship between the dose and percent mortality.

During the experiment we have studied on the attractant and repellent activity of tested plants extract, also recorded. Repellent activity founded in the plants, such as *Artemisia niligirica, Blumea eriantha, Hyptis suaveolens, Lavendula bipinnata* and *Ocimum gratissimum* for Mosquito.

Discussion

Botanical insecticides provide an alternative to synthetic insecticides because they are generally considered safe, are biodegradable and can offen be obtained from local sources (Prabhakar and Jabanesan, 2004). Phytochemicals may serve as suitable alternatives to synthetic insecticides in future as they are relatively safe, inexpensive, and are readily available throughout world. Protection against mosquito bites can be achieved by avoiding infested habitats, by wearing protective clothing, and by applying repellent (Fradin, 2001). Many studies have drawn attention of the toxic effects of plant extracts on related Diptera (Dhar et al., 1996). However, the present work is a further mile stone in the same line the above works have done the plants. During the present investigations *Annona squamosa*, *Artemisia niligirica* etc showed biopesticidal activity against *Aedes aegypti.* Babu and Murugan, (2000) investigated that the larvicidal effect of resinous exudates from the tender leaves of *Azadirachta indica.* Crude extract of leaves of *Solanum nigram* in water showed larvicidal activity against *A. culcifacies, C. quinquefasciatus* and *A. aegypti. Albizzia amara* and *Ocimum basilicum* considerably affect the mosquito survival and pronounced high repellent potential (Murugan et al. 2007). Zebitz (1984) reported the anti-acdysteroid activity of neem seed kernel extract in *Aedes aegypti*, resulting in growth inhibition and prolonged developmental period.

Acknowledgement

Authors are thankful to the University Grants Commission for financial support and to the Principal for constant support and encouragement.

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